PAWTUXET COVE
RHODE ISLAND

SURVEY

(REVIEW OF REPORTS)

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NOVEMBER 4, 1960

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U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM 54, MASS.

ADDRESS REPLY TO:
DIVISION ENGINEER

REFER TO FILE NO.
NEDGW

4 November 1960

SUBJECT: Survey (Review of Reports) on Pawtuxet Cove, Rhode Island

TO: Chief of Engineers
Department of the Army
Washington, D. C.
ATTN: ENGCW-P

1. The subject report is submitted in accordance with Paragraph 1-126, EM 1120-2-101. There are forwarded under separate cover:

a. Copies 1 to 10 of subject report with letters of transmittal.

b. Three (3) copies of a reduced key map.

c. A copy of the transcript of the public hearing held at Cranston, Rhode Island on 17 January 1958 with 5 copies of the public notice.

d. Three (3) copies of a draft of the public notice of the report.

e. Five (5) copies of Senate 148 supplement in addition to those bound in the report.

f. Copies of 4 letters concerning local cooperation; from the Rhode Island Division of Harbors and Rivers dated 2 September 1960, the City of Warwick dated 14 September 1960, the Rhode Island Division of Parks and Recreation dated 22 September 1960, and the City of Cranston dated 5 October 1960.

2. Copies of the report with other data required by EM 1120-2-101 are being forwarded directly to the Board of Engineers for Rivers and Harbors.

6 Incls u/s/c
As listed in Para. 1

SEYMOUR A. POTTER, JR.
Colonel, Corps of Engineers
Division Engineer

SURVEY

REVIEW OF REPORTS

PAWTUXET COVE

RHODE ISLAND

SYLLABUS

The Division Engineer finds that present and prospective recreational navigation at Pawtuxet Cove is limited by inadequate depths and lack of sheltered anchorage. Benefits that would result from improvement warrent a Federal project to provide a channel 6 feet deep to the head of the cove and 14 acres of anchorage 6 feet deep with a sheltering dike. The Federal cost would be (August 1960) $210,000 for construction, with future maintenance estimated at $7,500 annually. Other Federal costs are $9,000 for pre-authorization studies and $11,000 for additional navigation aids. The project benefit cost ratio is 1.5.

The Federal project is recommended subject to the requirements that local interests contribute 50 percent of the construction costs, provide lands, easements, rights-of-way, and spoil disposal areas, hold and save the United States free from damages, provide 2 public landings, regulate the use and development of harbor facilities, and remove or relocate locally constructed navigation aids. The required non-Federal costs are estimated as $210,000 for the cash contribution, $30,000 for spoil disposal bulk-heads, $20,000 for public landings and $1,000 for removal of navigation aids. The State of Rhode Island and the Cities of Cranston and Warwick have approved the project plan and are willing and able to meet these requirements.

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U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
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SUBJECT: Survey (Review of Reports) of Pawtuxet Cove, Rhode Island

TO: Chief of Engineers, Department of the Army, Washington, D. C.
ATTN: ENGCW-P

AUTHORITY

1. This report is submitted in compliance with the following resolution, adopted April 5, 1949:

> "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES, that the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on Pawtuxet Cove, Rhode Island submitted in House Document 603, 59th Congress 1st Session and previous reports, with a view to determining if it is advisable to modify the recommendations in the said report in any way at this time."

2. A review report was assigned to the New England Division by the Chief of Engineers on July 5, 1949.

PURPOSE AND EXTENT OF STUDY

3. The study was made to determine the economic justification of improving Pawtuxet Cove for navigation in accordance with the desires of local interests. In preparation of this report a detailed hydrographic survey was made to obtain soundings and probings in the areas desired for improvement. Data on the use of this harbor, and other nearby harbors, was studied to determine the adequacy of present facilities and the need for harbor improvements in the area. A public hearing was held at City Hall, Cranston, Rhode Island on January 17, 1958. Information obtained at the hearing is described below under "IMPROVEMENTS DESIRED." Local officials and other agencies were consulted to obtain further information. Available maps, charts and aerial photographs were studied and field trips were made to observe present conditions.

DESCRIPTION

4. Pawtuxet Cove is a small indentation on the west shore of the Providence River, a tributary of Narragansett Bay. It lies at the mouth of the Pawtuxet River, a small stream in central Rhode Island. There is no navigation on the Pawtuxet River itself as a small power dam has been constructed about 400 feet above its mouth at the head of the cove.

5. The cove itself is about 2,000 feet long and 400 feet wide. Depths vary from 2 to 10 feet in the center. Immediately south of the cove lies an area about 2,500 feet long by about 750 feet wide, bounded on the east side by rocks bare at low water. Depths in this area are 1 to 2 feet. North of the rocks lies the entrance channel presently used for navigation into Pawtuxet Cove. This channel has a controlling depth of about 4 feet, for a width of 75 feet. The entrance to the cove is about 3,000 feet from the Federal 35-foot Providence River channel.

6. The cove is well sheltered from winds in all directions, but the area south of the cove is exposed to winds from the northeast to southeast. The mean range of tide is 4.5 feet. The locality is shown on U.S. Coast and Geodetic Charts numbered 113 and 278 and on the map accompanying this report.

TRIBUTARY AREA

7. The immediate tributary area consists of the cities of Cranston and Warwick, Rhode Island. The cities are chiefly residential, both being suburban to the State Capital, Providence. The estimated population of Cranston in 1956 was about 59,000 with a tax valuation of $208,875,740. The population of Warwick in 1950 was 43,000 representing an increase of about 50 percent over the 1940 population. Both cities are enjoying a rapid rate of population increase. There are a few small industries in both cities. Pawtuxet Cove is used by residents from the entire Providence Area as a base for recreational boating.

8. The area is served by a network of good roads. Rail connections to the main line of the New Haven Railroad are about 6 miles west of each municipality. Hillsgrove Airport, a modern airport serving the "Greater Providence Area", lies within the city limits of Warwick.

BRIDGES AFFECTING NAVIGATION

9. There are no bridges in the portion of the waterway under consideration in this report. U.S. Highway 1A crosses the Pawtuxet River at the dam just above its entrance into the cove.

PRIOR REPORTS

10. The three prior reports on Pawtuxet Cove are described below:

Published In	Type of Report	Work Considered and Recommendation
Senate Examination Document 30, 48th Congress, 1st Session	Preliminary Examination 10 November 1882	Removal of rocks and shoal areas, provided the cost was moderate-unfavorable.
Annual Report Chief of Engineers 1893	Preliminary Examination 10 June 1893	Improvement of the harbor by dredging - unfavorable
House Document No. 603, 59th Congress, 1st Session	Preliminary Examination 8 March 1906	Improvement of the harbor by dredging a channel 150 feet wide by 12 feet deep on the southerly side of the harbor - unfavorable

11. The report of 8 March 1906 is the report currently under review.

EXISTING CORPS OF ENGINEERS PROJECT

12. There is no Corps of Engineers project for the navigational improvement of Pawtuxet Cove, and therefore no local cooperation has been required.

OTHER IMPROVEMENTS

13. Local interests have constructed a series of navigation aids to mark both entrance and inner channels. Two fixed lighted ranges on shore mark the entrance channel. Four piles placed along the entrance channel further mark this outer channel and additional piles have been driven inside the cove. These piles mark the channel and are also used for fore and aft mooring to avoid too much enchroachment on the deep water in the channel.

TERMINAL AND TRANSFER FACILITIES

14. There are several wharves, 2 boat yards and one marina in the cove. The wharves are generally of pile and timber construction with ramps and floats for boat servicing. The boatyards are engaged chiefly in the repair, hauling and storage of recreational craft. There are no

hauling facilities at the marina, its use confined to mooring craft during the recreational season. Service and supplies are available at this facility.

15. Of the wharves, one used by the Pawtuxet Athletic Club is located at the head of and on the westerly side of the cove. It is a pile and and timber marginal wharf with finger piers consisting of floats, held in place by mooring piles. About 15 boats, mostly outboards and small cruisers use this wharf for mooring purposes. Directly opposite this wharf and on the easterly side, the Foster Marina provides four finger piers, consisting of wooden floats held in place by mooring piles. Movable ramps connect the piers to the shore. About 60 boats can be moored at this facility as the boats moor normal to the piers and are secured fore and aft. Below this marina on the east bank of the cove is a 100-foot long marginal pile and timber wharf owned by the Beetle Company, and used chiefly for mooring a small lighter and towboat used in a boat hauling business. Three other small pile and timber wharves on the east side of the Cove are privately owned and used at the owner's convenience.

16. On the westerly side of the cove, just below the mouth of the Pawtuxet River, the Aspray's Boat Yards are located. This facility has 2 railways capable of hauling boats 50 feet in length. It also has an L shaped pile and timber wharf with facilities for servicing boats with fuel and water. Open storage for boats is also provided.

17. Opposite the cove entrance, another boatyard is operated by the Knight Company. It has one railway with a hauling capacity of 50 tons. Two small wharves, where boat service and repairs are obtainable, serve this facility. This yard also handles about 40 boats in open storage during the winter season.

IMPROVEMENT DESIRED

18. To determine the nature and extend of improvement desired by local interests, a public hearing was held at Cranston City Hall on January 17, 1958. The hearing was well attended by a Representative in Congress, State and municipal officials, members of the Pawtuxet Cove Improvement Association, representatives of yachting interests, local business interests, boatowners, and other interested individuals.

19. The desired improvement for the locality was developed by and presented by a local association known as the "Pawtuxet Cove Improvement Association." This group is composed of official representatives of both Warwick and Cranston, as well as boatyard owners and boatowners. The improvements requested consisted of dredging the cove channel to a depth of 6 or 8 feet, and providing additional anchorage in the area immediately south of the cove. Breakwater protection for the anchorage was also requested. The suggested breakwater would extend northward from Rock Island to the entrance channel.

20. Local interests report that prevailing shoal conditions in the cove have hampered operations of the existing fleets and have acted as a deterrent to normal expansion of boating in the locality. Numerous groundings at low water periods have resulted in considerable boat damage and have caused many boats to seek safer anchorage elsewhere. It was stated that the only available mooring space is either near the channel edge or in the channel itself. Consequently boats mooring in other locations go aground during low water periods and are not accessible for use during those times.

21. The operator of one boatyard stated that he formerly hauled over 200 boats per year. He now averages 40 boats annually as the larger boats hesitate to come into the cove due to fear of grounding while waiting for haulage. He also stated that if improvement were effected, he would enlarge his facilities, as he could increase his business considerably. Another boatyard owner has plans completed for a marina which could accommodate about 40 additional boats. Applications for space in this marina are already sufficient to fill it completely. The owner has stated that this facility will be constructed at the same time the cove is improved.

22. The advantages of using the cove as a harbor of refuge were cited by many advocates of improvement. Such a harbor would be of great benefit to the many boats that base in upper Narragansett Bay. The boat owners stated that there are very few sheltered areas in the locality offering protection from severe southerly storms and hurricanes. Pawtuxet Cove, if deepened, would accommodate many of these boats during such storms with a resultant savings from elimination of storm damage to boats.

23. During a conference with local interests after the hearing, they reported that in the past there had been a sizeable fishing fleet based in Pawtuxet Cove. The fleet was chiefly engaged in shellfishing and enjoyed a lucrative trade in that commodity. As the cove became more shoal, with attendant restrictive navigation, the boats moved to other bases. The number of boats thus moving was cited as between 15 and 20. It was stated that in their present localities, the boats can operate neither as conveniently nor as economically as they could with an improved Pawtuxet Cove. For this reason they felt that the major portion of the fleet would return, should improvement materialize.

24. Local interests also explained that when tidal conditions now permit, a fleet of 6 fishing boats, normally based in Point Judith, base in the cove. These boats fish for pogy and use the cove as a base when this type of fish run in the upper parts of Narragansett Bay and Providence River. They estimated that by basing in the cove these boats would save about 4 hours running time to and from Point Judith, resulting in increased time spent on the fishing grounds. They also felt that 6 more boats would base in Pawtuxet Cove during the periods of this fish run. Average length of a season for this type of fishing in the locality is about 3 months.

EXISTING AND PROSPECTIVE COMMERCE

25. Pawtuxet Cove has a small amount of fishing commerce. This fishing is mostly confined to shellfishing from small skiffs, powered by outboard motors. No navigational difficulties are experienced by these boats. However part of the catch is transported by a larger boat, drawing about 6 feet of water, which makes trips to Providence to market the catch. This boat can now navigate the cove only at high water.

26. During a season of approximately 3 months, 6 fishing boats from Point Judith base in Pawtuxet Cove during favorable tide periods. The average daily catch of these boats is estimated to be about 4 tons during a season, of about 70 days actual fishing. The fish, which is not edible, is delivered to other harbors and is usually used for making fertilizer or related products. No increase in this commerce is expected to result from the improvement desired by local interests.

27. There is a fleet of 136 recreational craft with an estimated average depreciated value of $624,000 based in Pawtuxet Cove. Although 40 of these boats are small outboards that would not benefit from improvement, the remainder are subject to delays, inconvenience, and damage because of inadequate depths and lack of sheltered anchorage. A substantial increase in the size of the recreational fleet would result from the desired improvement.

VESSEL TRIPS

28. There are no statistics on vessel trips in the waterway. However, on the basis of the locally reported recreational fleet of 136 boats and a few fishing boats, it is estimated that about 10,000 trips annually are made by local boats. This estimate is based on an average of 4 round trips per week for each boat. The improvement desired would attract additional boats and result in increased vessel traffic.

DIFFICULTIES ATTENDING NAVIGATION

29. Navigation at Pawtuxet Cove is hampered by shallow depths in the entrance channel and in the channel inside the cove. There is no available anchorage area where boats can moor without grounding at low tide. Consequently the boats moor fore and aft along the channel limits or dock at the existing wharves. With the boats moored along the channel, navigation to the wharves at the upper end is very difficult. Local interests report boat damage, both from collisions and groundings on the bank, as a result of these crowded conditions. There is also a large boulder in the present natural channel. The top of this boulder is 3.7 feet below mean low water. Boats often ground out while attempting to avoid this boulder at low tidal periods.

WATER POWER AND OTHER SPECIAL SUBJECTS

30. The waterway is tidal. Flood control, water power, and other related subjects are not pertinent to this report. Local interests have reported that pollution is a problem in the cove, although it does not affect navigation. They have requested that any improvement be designed so that it does not increase the problem. It is considered that the desired Federal navigation improvement would not have any noticeable effect on pollution of the cove. The State Division of Parks and Recreation is aware that closure of the waterway behind Rock Island might increase the pollution problem.

31. The U.S. Fish and Wildlife Service has been consulted on the effect of an improvement and their report is given in Appendix B. They have indicated that fish and wildlife habitat would not be significantly affected by the improvement, but recommend disposal of spoil west of Rock Island to avoid minor damages.

PLAN OF IMPROVEMENT

32. The improvement desired by local interests consists of (a) an entrance channel with a channel and turning basin in the cove 6 or 8 feet deep, (b) additional anchorage in the area immediately south of the cove 6 or 8 feet deep, and (c) shelter for the anchorage by means of either an earth-fill causeway or rubble stone breakwater extending from Rock Island to Marsh Island.

33. Consideration was given to both the 6- and 8-foot depths. A 6-foot depth would meet the needs of the boats expected to use the waterway. The maximum draft of the expected fleet is estimated at 5 feet with over 90 percent of the boats drawing less than 5 feet. Although there are larger boats at other nearby harbors which might use a deeper channel if it were available at Pawtuxet, the benefits to these boats would not be sufficient to justify the cost of a deeper channel.

34. A width of 100 feet for the entrance channel was selected as the most practicable for the cove. Widths of 60 and 75 feet were also considered but these widths would not be adequate for the traffic expected, particularly in fog or darkness. The greater width would reduce the probability of groundings on the banks, eliminating boat damage. For the same reason a channel 100 feet wide is considered necessary inside the cove. Local interests propose to construct a public landing at the head of the cove so this channel should extend to the berth area at the proposed landing. A turning and maneuvering basin is necessary as near the head of the cove as possible to assure full use of the channel.

35. Use of the existing fleet and future growth of boating is restricted because of the lack of anchorage space. Provision of adequate channels will permit private development of additional berthing facilities that will partially meet the need but it is estimated that open anchorage

space for 180 boats is also needed for the present and reasonably prospective recreational fleet. An anchorage area was designed for the area south of the cove to provide space for about 180 boats and permit future development of shore and marina type facilities. Using an anchoring density of 13 boats per acre, a reasonable value for small to medium sized recreational craft anchored fore and aft, indicates a need for about 14 acres. An anchorage about 1,800 feet long and ranging from 200 to 500 feet wide would provide the needed space in the most economical and desirable manner.

36. This anchorage would be exposed to local storm waves from the northeast, east and southeast. Winds from these directions have a fetch of 2 to 3 miles and generate local wind waves. Local interests stated that these waves reach a height of 2 to 3 feet during severe storms and that some form of breakwater protection was needed. They suggested that fill could be obtained from the anchorage to provide a dike extending from Rock Island to Marsh Island, a distance of about 2,200 feet.

37. Study of wind records and bottom contours in the area indicate that waves of 2 to 3 feet in the anchorage area would occur during storms several times a year. In view of this fact plus the indication by local interests that an unprotected anchorage would not be fully used, it was considered that breakwater protection for the anchorage should be an integral part of an improvement. Selection of the type of structure was based on economy and feasibility of construction.

38. An estimate was made for a rubble stone breakwater and 2 types of earth dike, one a free standing dike with side slopes of 1 vertical on 20 horizontal, the other with a revetted seaward side slope of 1 vertical and 4 horizontal. Either dike would utilize material from the anchorage that otherwise would have to be spoiled elsewhere. The free-standing earth dike would require groins and a jetty at its north end, near the entrance channel, to prevent the drift of material northward into the entrance channel. Comparison of the 3 designs indicated that the revetted dike would be much cheaper than the stone breakwater, and would eliminate the possibility of material drifting from the dike into the Providence main ship channel. The revetted dike was therefore selected as the most satisfactory design.

39. The still water level at Pawtuxet reached almost 17 feet above mean low water in the 1954 hurricane, but the highest tides usually do not go above 7.5 feet, and reach 7 feet only a few times each year. The dike has been designed with a top elevation 10 feet wide at 12 feet above mean low water to prevent wave overtopping at the highest annual tide levels. A higher dike would reduce the size of waves in the Cove and anchorage during hurricanes, but would not prevent the more important damages from high water levels and high winds, so that the additional cost of the higher dike could not be justified. For stability the dike was designed with a width of about 60 feet at elevation 8. The dike width at the ordinary mean high water level (elevation 4.5) would be 138 feet.

40. The dike was designed to be constructed in two stages, the first a construction dike 10 feet wide at elevation 6 of stable fill with 2 feet of stone riprap on an outer side slope of 1 vertical on 4 horizontal. This stage would retain material dredged from the anchorage. The second stage would be built to elevation 12 using part of the dredged fill. This stage would also have 2 feet of stone riprap, placed on an outer side slope of 1 vertical on 2 horizontal. The inside of the dike would be stable on a slope of 1 vertical on 10 horizontal from elevation 12 to elevation 8 and a slope of 1 vertical on 20 horizontal from elevation 8 to the existing bottom. This inside slope was designed to permit later construction of a bulkhead, docks and berths by local interests between the dike and the anchorage.

41. The plan of improvement selected after consideration of the above is the improvement requested by local interests. It would provide (a) a channel 100 feet wide and 6 feet deep at mean low water from deep water to the head of Pawtuxet Cove with a turning basin near the head of the cove, (b) an anchorage of about 14 acres 6 feet deep south of the entrance channel, and (c) a sheltering dike extending from Marsh Island to Rock Island on the east side of the anchorage. Local interests have been consulted and have expressed their satisfaction with this plan.

42. Local interests suggested that spoil not needed for the dike could be placed behind Rock Island to make land for park development or used to form a beach along the outer shore of Rock Island. They indicated that it would not be desirable to completely block the shallow waterway between Rock Island and the mainland because complete closure might increase pollution in the cove. The cost of spoil dikes to contain the fill without blocking the waterway behind Rock Island was found to be the same as the cost of groins necessary to retain material used as beach fill on the outside of Rock Island.

43. The Rhode Island Division of Parks and Recreation is developing plans for the Warwick Downs and Rock Island park area and has requested that any spoil not needed for the Federal project be placed on the outer shore of Rock Island if suitable for beach fill. Material not suitable for the beach should be placed behind Rock Island to fill land for park development.

SHORE LINE CHANGES

44. Construction of the dike would change the shore line, as would filling either behind Rock Island or constructing a beach on the outer shore of Rock Island. The dike was designed with a stone riprap outer face to prevent wave erosion. The beach, if constructed by local interests would require groins to hold the fill. The improvement would not otherwise affect the adjacent shore lines.

AIDS TO NAVIGATION

45. The United States Coast Guard maintains buoys at the outer end of the entrance channel. Local interests have provided lighted entrance range markers as well as piles to mark the channel. The Coast Guard has been consulted and has indicated that additional aids would be needed for the improvement. The estimated 13 new buoys would have a first cost of $11,000 and annual maintenance costs of $900. The Coast Guard does not anticipate construction of range lights for the harbor and noted that the existing channel range lights, which were established in 1917 and are private aids maintained by the City of Cranston, should be discontinued or relocated. Other locally constructed aids, piles that mark the channel, would also have to be removed or relocated by local interests to permit construction of the improvement. This work is estimated to cost about $1,000.

ESTIMATES OF FIRST COST

46. The first cost of construction of the considered improvement is detailed in Appendix A. Federal construction would consist of dredging the channel and anchorage and constructing the dike. The U.S. Coast Guard would provide necessary additional navigation aids. Local interests would remove or relocate the privately maintained navigation aids. Local interests would also be responsible for construction of the self liquidating public landings and dikes or groins for spoil disposal. The estimate is based on hydraulic dredging the mud and sand, removal of one boulder, and trucking in the fill for the first stage of the dike and the stone riprap. The dredging estimate includes an allowance for 1 foot of overdepth, side-slopes of 1 vertical on 3 horizontal, and contingencies. Costs are based on contract construction and prices prevailing in August 1960.

47. The improvement under consideration would cost:

Estimated First Cost

Dredging and boulder removal	$255,000
Dike construction	125,000
Engineering and Design	7,000
Supervision and Administration	33,000
Project Construction	$420,000
Preauthorization Studies	9,000
Navigation aids:	
Additional aids (Coast Guard)	11,000
Remove or relocate existing privately maintained aids (Local Interests)	1,000
Total Cost	$441,000

Estimated First Cost (Cont'd)

Required Non-Federal Construction (Self-Liquidating)	
2 Public landings	$20,000
Spoil disposal dikes or groins	30,000
Total (Self-Liquidating)	$50,000
TOTAL FEDERAL AND REQUIRED NON-FEDERAL COSTS (August 1960)	$491,000

ESTIMATES OF BENEFITS

48. Recreational Benefits. Improvement of Pawtuxet Cove would result in substantial benefits to the existing and prospective recreational fleets. These benefits will be shared by both the local and transient fleets. Benefits to the existing local fleet will result from increased use of the harbor and reduction in boat damage. Benefits will accrue to the prospective recreational fleet by allowing sufficient room for immediate expansion.

49. Benefits for recreational boats have been computed on the basis of the amount of net annual return to the owners if the boats were for hire. In general, the net return of a boat varies with its type and size, and is expressed in terms of a percentage of its average depreciated value. The ideal net return is the maximum that could be attained with full unrestricted use of the harbor. For this harbor the ideal net return varies from 12 percent for the smaller boats to 9 percent for the larger boats. Computation of the benefits considered the difference between the net return now received with the net return that can be achieved after improvement. The present value of the net return entailed consideration of such factors as lack of adequate anchorage, shallow depths at low water, and deficient navigational conditions of the cove for the various types of boats. Future value was based on the reduction of these deficiencies made possible by improvement.

50. The existing locally based recreational fleet consists of 136 boats. Of these 40 are outboards and the remainder inboards, cabin cruisers, and sailboats. At present there is no available anchorage space outside the existing channel. Consequently a large part of the fleet is forced to moor in the natural channel. Boats entering the cove are forced to thread their way through the moored boats to approach the wharf areas. Damage often results, either from bumping the moored boats, or from grounding on the shallow depths adjacent to the channel in attempting to avoid the moored boats. One boat owner cited damage of $1,000 resulting from navigating in the shallow depths. Others cited propeller damage and collision damage. Part of the fleet anchors outside the channel, preferring to allow their boats to ground out during low water, rather than anchor near the channel. The full use of the harbor is also restricted by the presence of a large boulder in the natural channel. In the past during periods of

low water and minus tides, deeper draft boats, in attempting to avoid this obstruction have grounded on the side of the channel. Present practice for these boats is to await high water periods.

51. From the above described conditions it is apparent that navigational conditions are a primary source of annual boat damage. From consultation with local interests and in recognition of the difficult navigational conditions prevalent in the harbor, it is conservatively estimated that annual boat damage in Pawtuxet Cove amounts to $1,500. It is further estimated that of this damage, 80 percent or $1,200 would be eliminated by channel improvement. The benefits from reduced boat damage would be entirely recreational, or $600 local and $600 general.

52. Benefits from increased use of the existing fleet have also been computed. It is considered that improvement will allow full unrestricted use of the harbor for this fleet, and annual benefits have been evaluated on this basis. The benefits will be entirely recreational and amount to $10,300 annually, of which $5,150 is considered general and $5,150 local. A detailed evaluation of the benefits is shown in Table No. 1.

53. Local interests predicted that 220 boats would be added to the local fleet immediately after improvement. This prediction was based partly on the number of applications for mooring space which have been received, and partly on their estimate of the cove as one of the more attractive bases for small boat activity in the Providence Metropolitan area. In justification of the prediction of more boats, a local marina operator stated that he had rejected several applications for space at his marina, due to the inadequate navigational facilities existing in the cove. He further stated that he would enlarge his facilities in the event of improvement. A marine yacht broker stated that he had several requests for new boat purchases in the event of additional anchorage being provided in the cove. Several other local boat owners and boat club members predicted various degrees of increase in boating activity.

54. In view of the above and in consideration of the natural optimistic attitude of local interests toward boating increases, it is conservatively estimated that 54 new boats will be added to the fleet immediately after improvement. Of these new boats 20 would be in the outboard motor class and the remainder cabin cruisers, auxiliary-sail and sailboats. This estimate of new boats is based on field trips made to the locality, consideration of boating activity in the general locality and consultation with local yachtsmen and yacht brokers. It is considered that the outboard motor boats will receive the full benefit of improvement inasmuch as the present crowded conditions precludes their basing there at this time. Benefits have been computed in Table 2 for these new boats and amount to $12,700 annually. The benefits, being recreational are classified as one-half general and one-half local or $6,350 each.

TABLE I

Benefits to Pleasure Boating
(Existing Fleet)

Type of Craft	Length (feet)	No. of Boats	Depreciated Value Average	Depreciated Value Total	Percent Return Ideal	% of Ideal Pres.	% of Ideal Future	Gain	Value $	On Cruise (150-day Season) Avg. Days	% of Season	Value $
Recreational Fleet												
Outboards	10-20	40	$500	$20,000	12	-	-	-	-	-	-	-
Inboards	10-20	12	1,000	12,000	12	80	100	2.4	$290	-	-	-
Cruisers	15-30	58	4,500	261,000	9	80	100	1.8	4,700	-	-	-
	31-50	19	15,000	285,000	9	80	100	1.8	5,130	15	10	$510
	51-60	1	35,000	35,000	9	80	100	1.8	630	30	20	130
Aux. Sail	25-30	2	4,000	8,000	9	80	100	1.8	140	15	10	10
Sailboats	10-20	4	750	3,000	12	80	100	2.4	70	-	-	-
Totals		136		$624,000					$10,960			$650

Total Benefits = $10,960 - $650 = $10,310 Say $10,300

TABLE II

Benefits to Pleasure Boating
(New Boats)

Recreational Fleet												
Outboards	10-20	20	$500	$10,000	12	-	100	12	$1,200	-	-	-
Inboards	10-20	5	1,000	5,000	12	-	100	12	600	-	-	-
Cruisers	15-30	11	4,500	49,500	9	-	100	9	4,450	7	5	$220
	31-50	3	15,000	45,000	9	-	100	9	4,050	15	10	400
Aux. Sail	15-30	4	4,000	16,000	9	-	100	9	1,440	15	10	140
	31-40	1	10,000	10,000	9	-	100	9	900	15	10	90
Sailboats	10-20	10	750	7,500	12	-	100	12	900	-	-	-
Totals		54		$143,000					$13,540			$850

Total Benefits = $13,540 - $850 = $12,690 Say $12,700

55. The cove is now filled to its capacity. Without improvement it is not possible to achieve normal growth of boating attributable to such factors as; population increases, increased popularity in recreational boating activity, and recent trends toward standardization of boat manufacture, which tend to make boating a less expensive sport. Should improvement be made, it is estimated that an average of about 3 boats per year would be added to the local fleet over the anticipated life of the project. Expressed as a percentage factor this represents an annual average increase of 2.2 percent over the present fleet of 136 boats, and would amount to a total of 150 boats in the fiftieth year. This average increase of boats is considered reasonable in view of the most recent compilations by authoratative yachting publications, which show the national average annual increase to be 6 boats per 10,000 of population. For the immediate tributary area of Cranston and Warwick, such an average if applied would amount to at least 60 boats per year. However it is considered that the present national average will not hold for the anticipated life of the project therefore the more conservative average was used. The additions attributable to this factor are shown in Table 3 with the computed benefits at about $30,000 that would result at the end of the 50 year project life. The full annual return has been used for these boats since they could not be added to the fleet if the harbor were not improved.

56. These boats are assumed to be added uniformly over the project life so that the benefit resulting would increase on a straight line from zero when the project is built to $30,000 at the end of 50 years. The average annual equivalent benefit for this series computed at an interest rate of 2 5/8 percent is about $12,000. This annual equivalent benefit resulting to recreational boating is classified as 50 percent general and 50 percent local, or $6,000 each.

57. Fishing Benefits. Local interests have indicated that benefits could be derived for about 6 transient fishing boats, normally based in Wickford Harbor about 16 miles southerly in Narragansett Bay. These boats base intermittently at Pawtuxet Cove during a 2 to 3 month fishing season in the upper bay. As the boats draw in excess of four feet, it is not possible for them to use the cove during the entire season, but only during favorable high tidal periods. During unfavorable low tidal periods, when use of the cove is not possible the boats are said to return to their base. The 2 to 3 hours thus spent if used on the fishing grounds would result in an increased fish catch. The particular fish caught are locally known as "pogy", a variety of "trash fish" normally used for reduction to fertilizer or processed for animal food. Although the boats base intermittently in the cove, it is not considered that such basing is primarily attributable to availability of the fishing grounds. There are several boat harbors in the vicinity having sufficient depths for this type of boat, and it appears that the major reasons for visiting Pawtuxet Cove is the ease of procuring supplies, minor repairs, and boat servicing. For this reason it is considered doubtful that any fishing time would be saved by additional use of Pawtuxet Cove and therefore no increased "pogy" catch would result from the improvement under consideration.

TABLE III

Benefits to Pleasure Boating
(Normal Growth)

Type of Craft	Length (feet)	No. of Boats	Depreciated Value Average	Depreciated Value Total	Percent Return Ideal	% of Ideal Pres.	% of Ideal Future	Gain	Value $	On Cruise (150-day Season) Avg. Days	% of Season	Value $
Recreational Fleet												
Outboards	10-20	60	$500	$30,000	12	-	100	12	$3,600	-	-	-
Inboards	10-20	25	1,000	25,000	12	-	100	12	3,000	-	-	-
Cruisers	15-30	25	4,500	112,500	9	-	100	9	10,120	7	5	$510
	31-50	7	15,000	105,000	9	-	100	9	9,450	15	10	950
Aux. Sail	15-30	10	4,000	40,000	9	-	100	9	3,600	15	10	360
	31-40	3	6,000	18,000	9	-	100	9	1,620	15	10	160
Sailboats	10-20	20	750	15,000	9	-	100	9	1,350	-	-	-
Totals		150		$345,500					$32,740			$1,980

Total Benefits = $32,740 - $1,980 = $30,760 Say $30,000

58. Some of the boats based in the cove engage in shellfishing. These boats are small outboard powered skiffs, drawing 2 feet or less, which incur no navigational difficulties in the cove. The catch, less that part which is sold locally, is collected by a larger boat based in the cove that delivers it to market. As this boat draws between 5 and 6 feet, it is said to experience tidal delays getting in and out of the harbor. Local interests report about two or three trips a week for this vessel. It appears that the tidal delays are avoided by scheduling the trip to coincide with favorable tide periods and that no transportation saving or any reduction in the cost of the shellfish delivered to Providence would result from the improvement.

59. The U. S. Fish and Wildlife Service has been consulted on the possibility of fishing benefits from the improvement. They concur that no commercial fisheries benefits would result from the improvement. They also report that the riprapped sand dike would be a desirable site for publicly owned permanent duck blinds.

60. Land Enhancement. Consideration has also been given to the possibility of land enhancement benefits resulting from the improvement. Use of the spoil from the improvement to fill land behind Rock Island would add about 4 acres to the State Park. Presumably this park land would have the same value as undeveloped private land in Warwick, about $10,000 per acre, and would therefore be worth about $40,000 if there were any means of access to it. The retaining dikes necessary to hold the fill in place are estimated to cost $30,000, and since the cost of a footway to permit use of this land is estimated to be over $10,000 it does not appear that there would be any immediate net value resulting in land enhancement benefits. The same consideration applies to the possible use of the spoil material for beach fill along the outer shore of Rock Island; the necessary groins to hold the fill would cost $30,000 and an access bridge to make use of the beach possible would cost over $10,000, which is more than the increased value of the beach resulting from the fill.

61. However, the spoil from the navigation improvement would reduce the future cost of beach and park development by the State of Rhode Island. The value of the fill would depend on the timing of the beach development and the extent to which the construction to retain the fill could be absorbed in the future development. If the State development were under construction when the spoil became available, the value to the State could be measured by the cost of other fill to the State. Assuming the cost of beach fill at about $1.00 per cubic yard placed by hydraulic dredge from immediately offshore would give a value of $65,000 for the spoil available from the navigation project. Using an interest rate of 3.5 percent and a 50 year life would result in an annual equivalent value of about $2,800. Since this value is the maximum possible, which would result only if the park were developed at the same time as the navigation improvement, to be conservative the land enhancement benefit has been taken as $2,000, a little less than 2/3 of the computed maximum possible value.

62. Summary. The total evaluated annual benefits, summarized below, amount to $38,200. It is considered that all these benefits, both to recreational navigation and land enhancement, are 50 percent general and 50 percent local in nature.

Annual Benefits	General	Local	Total
Recreational boats:			
Reduction in damage to existing fleet	$600	$600	$1,200
Increased use:			
Existing fleet	5,150	5,150	10,300
New boats	6,350	6,350	12,700
Future growth	6,000	6,000	12,000
Land enhancement	1,000	1,000	2,000
TOTAL	$19,100	$19,100	$38,200
Percent	50%	50%	100%

63. The above evaluated benefits are primary benefits directly resulting from the navigation improvement under consideration. In addition the improvement would result in substantial increases in the business of the immediate area, enhance the local land values and attract new people to the area. Although these benefits are real and important to the local communities, they are considered to be secondary benefits which should not be used as justification for the Federal project, and therefore have not been evaluated.

ESTIMATE OF ANNUAL CHARGES

64. Annual charges for construction of the channel anchorage and sheltering dike are based on an interest rate of 2.625 percent for Federal investment, 3.5 percent for non-Federal public investment, and a project life of 50 years. In view of the local benefits, a non-Federal investment of 50 percent of the construction cost has been used. The annual maintenance for the Federal project has been based on a shoaling rate of 3,000 cubic yards per year, and repairs to the dike revetment averaging 200 tons of stone per year. No annual charges are computed for self-liquidating costs for public landings or spoil disposal.

Federal Investment	
Construction ($420,000) (.50)	$210,000
Preauthorization Studies	9,000
Navigation aids (Coast Guard)	11,000
Total Federal Cost	$230,000
Non-Federal Investment	
Cash Contribution ($420,000) (.50)	$210,000
Remove or relocate local navigation aids	1,000
Total Project Cost	$211,000
Federal Annual Charges	
Interest and Amortization ($230,000) (0.03614)	$8,300
Maintenance Dredging ($6,000)	
Dike ($1,500)	7,500
Maintenance Additional Navigation Aids	900
Total Federal Annual Charges	$16,700
Non-Federal Annual Charges	
Interest and Amortization ($211,000) (0.04263)	$9,000
Total Annual Charges	$25,700

COMPARISON OF BENEFITS AND COSTS

65. The considered Federal project for Pawtuxet Cove, with evaluated annual benefits of $38,200 and estimated annual charges of $25,700, would have a benefit-cost ratio of 1.5.

PROPOSED LOCAL COOPERATION

66. There has been no prior Federal improvement at Pawtuxet Cove and there is no Federally owned property in the area. Access will be needed for construction and maintenance of a Federal project. The dike extending from Rock Island to Marsh Island will require lands or easements for construction and future maintenance. It is understood that ownership of the land and water areas rests with the State or the City of Warwick so that the necessary lands or easements could be provided at no cost. Spoil disposal areas will be needed for dredged material not needed for the Federal dike. The State Division of Parks and Recreation has requested the spoil, and it has been estimated that dikes or groins would cost about $30,000. In view of the

above it is considered that local interests should be required to provide without cost to the United States, all lands, easements and rights-of-way and spoil disposal areas with any needed bulkheads, dikes or groins, necessary for construction and future maintenance of the project.

67. As for all other Federal navigation projects in the State, local interests should be required to hold the United States free from damages that may result from construction and maintenance of the project.

68. Full use of the Federal improvement would not be possible without public access. Suitable commercial repair and supply facilities are available but there are no public landings. Two public landings are needed, one near the head of the cove and one near the anchorage. It is considered that local interests should provide and maintain the necessary public landings, which could be provided for $10,000 each. The City of Cranston has indicated that it would provide a landing at the head of the cove. The City of Warwick is planning construction of a landing adjacent to the anchorage.

69. To insure full use of the Federal improvement, local interests should be required to regulate the use, growth and free development of the harbor facilities with the understanding that said facilities will be open to all on equal terms. The two cities and the State are competent public bodies to act in this regard.

70. In view of the nature of the benefits which would result from improvement of Pawtuxet Cove (recreational navigation and land enhancement), local benefits are 50 percent of the total evaluated benefits. It is therefore considered that local interests should be required to contribute 50 percent of the construction cost. This cash contribution is estimated at $210,000.

71. Local interests have installed piles to mark the natural channel. It is considered that they should be required to remove or relocate these navigation aids as necessary to permit construction of the Federal Project. This work is estimated to cost about $1,000.

72. Officials of Cranston, Warwick, and the State of Rhode Island have been consulted and have advised that the requirements of local cooperation would be met. They consider that the cash contribution might be paid one-half by the State and one-fourth by each of the two cities. Each of the two cities has indicated willingness to provide a public landing.

APPORTIONMENT OF COSTS AMONG INTERESTS

73. Costs for the improvement under consideration have been apportioned between the United States and local interests so that the Federal and non-Federal share of the first cost of construction are in the same

ratio as the evaluated general and local benefits. Therefore 50 percent of the construction cost has been apportioned to local interests as a cash contribution. Other Federal costs are the preauthorization study costs and the costs of additional navigation aids. Other local costs are the self liquidating costs for public landings and spoil disposal areas. In addition, the cost of removing or relocating locally owned navigation aids has been apportioned to local interests. The apportionment of project costs among agencies and interests is shown below.

Summary of Estimated Costs
(Aug 1960)

Federal Costs		
Corps of Engineers:	Project Construction	$210,000
	Preauthorization Studies	9,000
		$219,000
Coast Guard Additional Navigation Aids		11,000
	Total Federal	$230,000
Required Non-Federal Costs (Local Interests)		
Cash Contribution		$210,000
Removal or relocation of private navigation aids		1,000
Public landings (2)		20,000 *
Dikes or groins for spoil disposal		30,000 *
	Total Non-Federal	$261,000
Total Federal and Required Non-Federal Costs		$491,000

*Self-liquidating

COORDINATION WITH OTHER AGENCIES

74. All Federal, State and local agencies having interest in the improvement of Pawtuxet Cove were notified of the public hearing held in Cranston 17 January 1958. The U. S. Fish and Wildlife Service, the U. S. Coast Guard, the State of Rhode Island, the Cities of Cranston and Warwick, and other local interests have all been consulted during the study. The Fish and Wildlife Service anticipates no significant commercial fisheries benefits would result from improvement, and recommends disposal of spoil west of Rock Island to avoid minor damage to wildlife habitat. They also recommend future exploration of possibilities of public waterfowl hunting use of the sand dike. The full Fish and Wildlife Service report is given in Appendix B. The Coast Guard has furnished information on the costs for needed additional navigation aids. The State and the two cities have advised of their approval of the plan of improvement and the willingness of local interests to cooperate in a Federal project.

DISCUSSION

75. Pawtuxet Cove is a small boat harbor on the west shore of the Providence River at the head of Narragansett Bay, about 5 miles south of the center of Providence, Rhode Island. The Cove, and the Pawtuxet River which enters at the head of the cove forms the boundary between the Cities of Cranston and Warwick and is used by a fleet of small fishing and recreational boats. Local interests have provided terminal facilities and navigation aids, but no other improvements for navigation have been made.

76. Present navigation in Pawtuxet Cove is limited by inadequate depths and insufficient anchorage areas. There has been a substantial increase in recreational boating activity in Rhode Island in recent years and local interests desire Federal navigation improvements to meet the increased and propspective demand. Future development of recreational boating will be severely restricted unless the cove is improved.

77. Consideration of the improvement desired indicated that substantial benefits to recreational navigation would result from improvement and a Federal project has been designed to best meet the desires of local interests and the needs of navigation at the lowest possible cost. This project would provide a channel 6 feet deep and 100 feet wide to the head of the Cove where the City of Cranston proposes to construct a public landing, a turning basin 6 feet deep near the head of the Cove, and an anchorage basin of about 14 acres, 6 feet deep extending south from the entrance channel with a sheltering dike 12 feet above mean low water and 2,200 feet long on the east side of the anchorage.

78. This improvement would cost $420,000 for construction, and in view of the resulting benefits this cost should be shared equally between local interests and the United States. In addition there would be other Federal costs of $9,000 for preauthorization studies and $11,000 for additional navigation aids, and other required non-Federal costs estimated at $20,000 for public landings, $30,000 for spoil disposal dikes or groins, and $1,000 to remove or relocate private navigation aids. The total Federal and required non-Federal cost for this project is estimated as (August 1960) $491,000.

79. This improvement would benefit the existing recreational fleet by reducing boat damages and increasing the use of the existing fleet. It would result in the immediate addition of new boats to the fleet and permit the future growth of boating at Pawtuxet Cove and near the City of Providence. There would be a slight additional benefit from land enhancement resulting from use of excess spoil for land and beach fill in the State's Warwick Downs - Rock Island park development. These benefits total $38,200, of which one-half is considered a general benefit and one-half a local benefit. In addition there would be substantial benefits to the local economy in the immediate area which have not been evaluated. The evaluated annual benefits of $38,200, when compared to the computed annual charges of $25,700, indicates a benefit-cost ratio of 1.5.

80. The State of Rhode Island and the Cities of Cranston and Warwick have been consulted on the improvement and the indicated requirements of local cooperation. They have approved the plan and agreed to share the local cooperation; the cash contribution to be divided between the Cities and the State, a public landing to be provided by each City and the spoil disposal bulkheads or groins to be provided by the Rhode Island Department of Public Works, Division of Parks and Recreation.

81. All other agencies which might be affected by Federal improvement of Pawtuxet Cove have been consulted. The U. S. Coast Guard has advised of the need and the cost of additional navigation aids that would be needed. The U. S. Fish and Wildlife Service has reported that the improvement would not result in commercial fishing benefits or have any significant effect on fish and wildlife resources. They recommend spoil disposal west of Rock Island to avoid minor damages. They also recommend investigation of the possibilities of public waterfowl hunting use of the sand dike during detailed project planning. The final details of spoil disposal and possible waterfowl hunting use of the sand dike will be developed during final project design.

82. Additional information on recommended and alternative projects called for by Senate Resolution 148, 85th Congress, 1st Session adopted 28 January 1958 is contained in an attachment of this report.

CONCLUSIONS

83. The desires of local interests and the present and prospective needs of navigation at Pawtuxet Cove would be met by a Federal navigation project to provide a channel and 14-acre anchorage 6 feet deep with a dike 2,200 feet long to shelter the anchorage. This improvement would result in benefits to recreational boating and land enhancement that would yield a ratio of annual benefits to annual costs of 1.5. Local interests are willing and able to meet the indicated requirements of local cooperation.

RECOMMENDATIONS

84. In view of the foregoing, the Division Engineer recommends a Federal navigation project at Pawtuxet Cove, Rhode Island to provide a channel 100 feet wide and 6 feet deep from deep water to the head of Pawtuxet Cove with a turning basin near the head of the Cove, and an anchorage of about 14 acres 6 feet deep south of the entrance channel with a sheltering dike 2,200 feet long constructed to 12 feet above mean low water on the east side of the anchorage; at a Federal first cost of $210,000 for construction and an estimated $7,500 annually for future maintenance. This recommendation is made subject to the condition that local interests (a) provide without cost to the United States all necessary lands, easements, and rights-of-way, including spoil disposal areas with necessary retaining dikes, bulkheads, groins and embankments therefor, needed for the construction and maintenance of the project when and as required; (b) hold and save the United States free from damages that may result from the construction and maintenance of the project; (c) provide and maintain without cost to the United States necessary mooring facilities and utilities including two public landings with suitable supply facilities

open to all on equal terms in accordance with plans approved by the Chief of Engineers; (d) regulate the use, growth and free development of the harbor facilities with the understanding that said facilities will be open to all on equal terms; (e) make a cash contribution toward the first cost of construction as a lump sum prior to construction amounting to 50 percent of the Federal project construction cost, and (f) remove or relocate locally constructed navigation aids.

SEYMOUR A. POTTER, JR.
Colonel, Corps of Engineers
Division Engineer

5 Incls
1. General Map
2. Survey Map
3. Appendix A - Estimate of First Cost
4. Appendix B - Fish & Wildlife Report
5. Sen. 148 - Supplement

CORPS OF ENGINEERS

U. S. ARMY

CRANSTON

WARWICK

PROPOSED LOCATION
CRANSTON PUBLIC LANDING

FOSTER MARINA

PAWTUXET ATHLETIC CLUB

DAM

PAWTUXET RIVER

WASHOUSET POINT

ASPRAY'S BOAT YARDS

PAWTUXET COVE

KNIGHT'S BOAT YARD

MARSH ISLAND

POSSIBLE LOCATION
WARWICK PUBLIC LANDING

TOE OF DIKE

M.H.W. ON DIKE
TOE OF DIKE

WARWICK DOWNS

STATE PARK

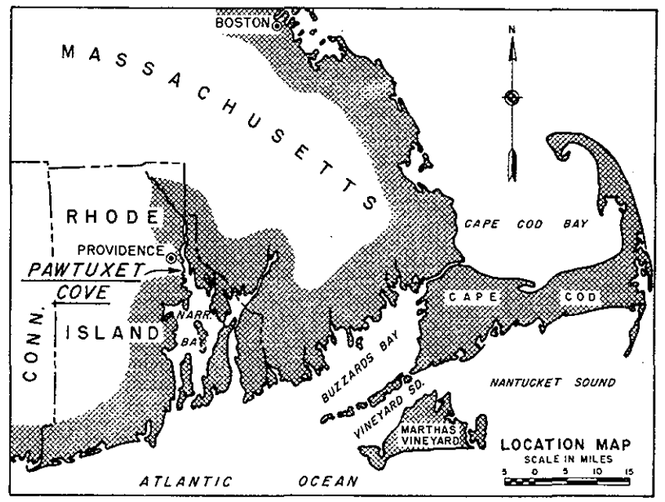
ROCK ISLAND

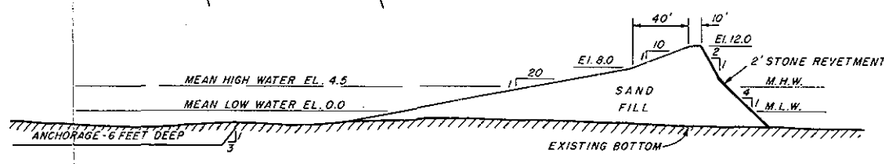
PROPOSED SPOIL DISPOSAL AREAS

EXISTING PROVIDENCE RIVER FEDERAL CHANNEL
35-FEET DEEP

DESIRED IMPROVEMENT RECOMMENDED

- CHANNEL - 6 FEET DEEP
- ANCHORAGE - 14 ACRES, 6 FEET DEEP
- DIKE - 12 FEET HIGH





TYPICAL DIKE SECTION
SCALE IN FEET
HOR. 40 0 40 80
VERT. 10 0 10 20

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS, WALTHAM, MASS.

PAWTUXET COVE
RHODE ISLAND
GENERAL MAP

SCALE IN FEET
200 0 200 400 600

OCT. 1960

APPROVED:
CHIEF ENGINEERING DIVISION

SUBMITTED:
CHIEF PLANNING AND REPORTS BRANCH

CHIEF, RIVER AND HARBOR SECT.

PROJECT ENGINEER

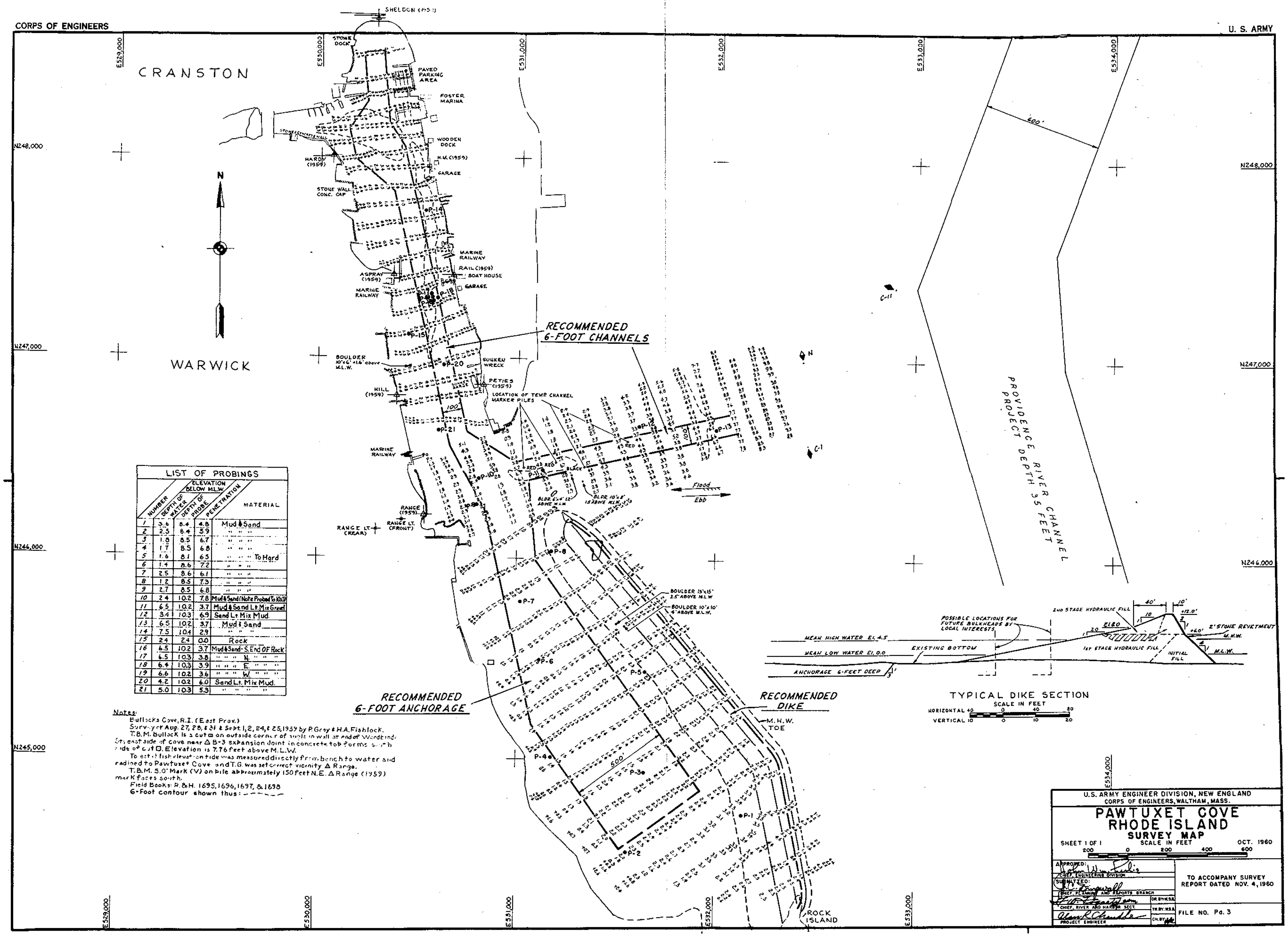
DR BY A.L.D.
TR BY A.L.D.
CH BY

TO ACCOMPANY SURVEY REPORT DATED NOV. 4, 1960

FILE NO. Pg. 2

CORPS OF ENGINEERS

U. S. ARMY



LIST OF PROBINGS				
NUMBER	ELEVATION BELOW M.L.W. DEPTH OF WATER	DEPTH OF PROBE	PENETRATION	MATERIAL
1	3.6	8.4	4.8	Mud & Sand
2	2.5	8.4	5.9	" " "
3	1.8	8.5	6.7	" " "
4	1.7	8.5	6.8	" " "
5	1.6	8.1	6.5	" " " To Hard
6	1.4	8.6	7.2	" " "
7	2.5	8.6	6.1	" " "
8	1.2	8.5	7.3	" " "
9	2.7	8.5	6.8	" " "
10	2.4	10.2	7.8	Mud & Sand (Note Probed To 10.0)
11	6.5	10.2	3.7	Mud & Sand Lt. Mix Gravel
12	3.4	10.3	6.9	Sand Lt. Mix Mud.
13	6.5	10.2	3.7	Mud & Sand
14	7.5	10.4	2.9	" " "
15	2.4	2.4	0.0	Rock
16	6.5	10.2	3.7	Mud & Sand - S. End Of Rock
17	6.5	10.3	3.8	" " " N. " " "
18	6.4	10.3	3.9	" " " E. " " "
19	6.6	10.2	3.6	" " " W. " " "
20	4.2	10.2	6.0	Sand Lt. Mix Mud.
21	5.0	10.3	5.3	" " " "

Notes:

Bullocks Cove, R.I. (East Prov.)

Surveyed Aug. 27, 28, & 31 & Sept. 1, 2, 24, & 25, 1959 by P. Gray & H.A. Fishlock.

T.B.M. Bullock is a cut □ on outside corner of angle in wall at end of Wendland St, east side of cove near Δ B-3 expansion joint in concrete top forms south side of cut □. Elevation is 7.76 feet above M.L.W.

To establish elevation tide was measured directly from bench to water and radioed to Pawtuxet Cove and T.G. was set correct vicinity Δ Range.

T.B.M. 5.0' Mark (V) on pile approximately 150 feet N.E. Δ Range (1959) mark faces south.

Field Books: R.&H. 1695, 1696, 1697, & 1698

6-Foot contour shown thus: - - - -

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS, WALTHAM, MASS.

PAWTUXET COVE RHODE ISLAND
SURVEY MAP

SHEET 1 OF 1 — SCALE IN FEET 200 0 200 400 600 — OCT. 1960

APPROVED: [signature] CHIEF, ENGINEERING DIVISION

SUBMITTED: [signature] CHIEF, PLANNING AND REPORTS BRANCH

[signature] CHIEF, RIVER AND HARBOR SECT.

[signature] PROJECT ENGINEER

DR. BY: W.S.B. TR. BY: W.S.B. CH. BY:

TO ACCOMPANY SURVEY REPORT DATED NOV. 4, 1960

FILE NO. Pa. 3

PAWTUXET COVE
RHODE ISLAND

APPENDIX A

ESTIMATE OF FIRST COST

1. The first cost is given below for the improvement recommended in this report. Federal construction consists of dredging to provide a channel 6 feet deep and 100 feet wide to the head of Pawtuxet Cove, with a turning basin 6 feet deep near the head of the Cove; and an anchorage 6 feet deep of about 14 acres extending south of the cove; and construction of a sheltering dike to 12 feet above mean low water and about 2,200 feet long. Construction of two public landings is required of local interests. The entrance channel range lights and marker piles now maintained by local interests will have to be removed or relocated by them. The U. S. Coast Guard will provide other necessary navigation aids.

2. Probings made during the study indicate that dredging will consist of mud and sand which can be removed by hydraulic dredge and spoiled nearby. There is one boulder in the channel area which will have to be removed by a small lighter. The dike, which is to be partly constructed of material dredged from the channel and anchorage, will require placement of stone riprap along the outer face. Dredged material not needed for the sand dike may be spoiled behind Rock Island at the south end of the dike, or placed along the outer shore of Rock Island for beach use.

3. Dredging quantities are in terms of in place measurement and include an allowance of 1 foot of overdepth and side slopes of 1 vertical on 3 horizontal. Selected fill, and stone riprap for the dike can be obtained from local land sources. Cost estimates are based on prices prevailing in August 1960.

4. Local construction costs for spoil disposal dikes are based on disposal of 65,000 cubic yards of dredged material, the excess not required for the dike, either behind Rock Island where bulkheads or spoil dikes would be needed to retain the fill and keep the waterway open, or to form a beach along the outer shore of Rock Island where groins will be required to retain the material. There is no cost advantage for either method, the cost of groins being equal to the cost of the spoil dike.

5. The detailed estimate of cost is as follows:

PROJECT COST ESTIMATE

Cost Account Number	Item		Cost Estimate ($1,000) (Aug 60)
09	CHANNELS - 6' channel and anchorage		
	(Dredging 190,000 c.y. @ $1.15 - 220.0)		
	(Remove boulder @ lump sum - 5.0)		
	(Contingencies @ 15% - 30.0)		255.0
10	BREAKWATERS AND SEAWALLS - Dike		
	(Fill 26,000 c.y. @ $2.00 - 52.0)		
	(" 14,700 c.y. @ .27 - 4.0)		
	(Revetment 10,700 tons @ 5.00 - 53.0)		
	(Contingencies @ 15% - 16.0)		125.0
			380.0
29	PREAUTHORIZATION STUDIES		9.0
30	ENGINEERING AND DESIGN		7.0
31	SUPERVISION AND ADMINISTRATION		33.0
TOTAL COST (Corps of Engineers Funds and Non-Federal Contributions)			429.0
Non-Federal Contributions			210.0
TOTAL NON-FEDERAL COSTS			
	Lands and Damages	0	
	Relocations	0	
	Other:		
	Cash Contributions (50% of 420.0)	210.0	
	Public landings (2)	20.0	
	Dikes or groins for spoil disposal	30.0	
	Removal or Relocation of Private Navigation Aids	1.0	
TOTAL NON-FEDERAL COSTS		261.0	

SUMMARY OF ESTIMATED COSTS

Federal Cost	
Corps of Engineers	219.0
Coast Guard	11.0
Required Non-Federal Costs	
Cash Contribution	210.0
Other	51.0
TOTAL FEDERAL AND REQUIRED NON-FEDERAL COSTS	491.0

PAWTUXET COVE

RHODE ISLAND

APPENDIX B

U. S. FISH AND WILDLIFE SERVICE REPORT

By letter of 12 August 1960 the Regional Director of the United States Fish and Wildlife Service was advised of the plan of improvement under consideration and requested to comment on the effect of the improvement on fish and wildlife. The study indications that no benefit would result from increased pogy fishing or shellfish transportation were explained and comment on this and on the possibility of other fishing benefits were requested. Comments were also requested on the effect of the plan of improvement and spoil disposal on fish and wildlife. The full report of the Fish and Wildlife Service follows.

United States
Fish and Wildlife Service
Department of the Interior

October 7, 1960

Division Engineer
New England Division
U. S. Army, Corps of Engineers
424 Trapelo Road
Waltham 54, Massachusetts

Dear Sir:

This letter, prepared with the cooperation of the Rhode Island Division of Fish and Game, constitutes our report on your navigation survey study of Pawtuxet Cove, Rhode Island. Improvements under consideration include a 6' channel, a protected anchorage, and a sand dike to shelter the anchorage. (See General Map)

It is our understanding that the entrance channel and anchorage area 6 feet in depth would be constructed by hydraulically dredging approximately 185,000 cubic yards of bottom material. About 125,000 cubic yards of this material would be used to construct a sand dike with a top elevation of 12 feet from Rock Island to Marsh Island. The sand dike has been designed with a riprap revetment along the entire outer face from Rock Island to Marsh Island to prevent erosion.

The remaining 60,000 cubic yards of material would be spoiled on areas provided by local interests. One possibility for this spoil disposal would be the filling of about one-half the area behind Rock Island where local interests would be required to provide a dike to hold the fill material. The other possibility would be spoil disposal along the outer shore of Rock Island to create a beach, and local interests would be required to provide groins to hold the material on the beach.

There are important quahog (hard clam) resources in the project area. Soft clams are found, to a lesser extent, in the vicinity of the project. Although shellfishing is prohibited in the Providence River area due to domestic pollution the shellfishery is considered a potentially important resource. The area is presently used as a shellfish seed source for restocking unpolluted areas of Narragansett Bay. At certain times of the

year scattered populations of striped bass, bluefish, scup, flounder, and weakfish can be found in the area. The area is an important concentration point for commercial purse seine operations for catching menhaden in season.

Migrating and wintering waterfowl utilize the Providence River area extensively, and a favored feeding spot is between the Providence River channel and Rock Island.

Fish and wildlife habitat would not be significantly affected by the proposed improvement; however, spoil disposal of the excess 60,000 cubic yards of material would be least damaging to our interests if the spoil material were placed west of Rock Island, filling one-half of the area behind Rock Island rather than along the outer shore of Rock Island. The riprapped sand dike would furnish a desirable site for publicly-owned permanent duck blinds.

Local interests have stated that the improvement would result in benefits from an increased commercial fish catch. About 6 transient fishing boats, normally based in Wickford Harbor, are said to use Pawtuxet Cove as a base to catch menhaden in upper Narragansett Bay. Because present use of Pawtuxet Cove by these craft is limited to high tide periods, they are said to return to Wickford, while the improvement would permit them to remain near the fishing area and fish an extra 2 or 3 hours now spent traveling. Your investigation indicated that there were other harbors near the head of Narragansett Bay which were suitable for these craft so that the present use of Pawtuxet Cove does not appear to be primarily attributable to its nearness to the fishing grounds. For this reason you considered that no time would be saved by additional use of Pawtuxet Cove, and therefore no increased menhaden catch would result from the improvement under consideration. We concur in these findings.

Local interests have also stated that although the boats used locally for shellfishing from Pawtuxet Cove incur no navigation difficulties, the larger boat that makes 2 or 3 trips a week to Providence transporting part of the shellfish catch is subject to tidal delays. Your investigation indicated that the delays are now avoided by scheduling the trip and that no transportation saving or any reduced cost of the shellfish delivered to Providence would result from the improvement. We concur with these findings, also.

This Service, therefore, agrees with your conclusion that no commercial fisheries benefits would result from the improvements.

In summary, we report that while no significant damages to fish and wildlife resources would result from the construction of the improvement as presently contemplated, we recommend disposal of excess spoil material west of Rock Island to avoid minor damages. We also recommend that the

possibilities of the public waterfowl hunting use of the sand dike be explored with this Service and the Rhode Island Division of Fish and Game during more detailed stages of project planning. We anticipate no significant benefits to the commercial fishing industry from project construction. No further fish and wildlife studies by this Service will be required, unless there are changes made in the plan or the manner in which the work will be performed.

The opportunity to report on this project at an early planning stage is much appreciated.

Sincerely yours,

John S. Gottschalk
Regional Director
Bureau of Sport Fisheries & Wildlife

John T. Gharrett
Regional Director
Bureau of Commercial Fisheries

PAWTUXET COVE, RHODE ISLAND

Information Called for by Senate Resolution 148, 85th Congress, Adopted 28 January 1958

1. Navigation Problems. Pawtuxet Cove is a small boat harbor on the west side of Narragansett Bay about 5 miles south of Providence on the line between the Cities of Cranston and Warwick. The cove is about 400 feet wide and 2,000 feet long with depths ranging to 10 feet. The tide range is 4.5 feet.

2. Use of the cove is restricted by inadequate depths and insufficient anchorage for the present fleet of small fishing boats and recreational craft. Future development of recreational boating in the area will depend on navigation improvements.

3. Improvement Considered. Local interests requested a channel and anchorage 6 or 8 feet deep with a protective breakwater. As the largest craft expected to use the cove have a draft of 5 feet, a channel 6 feet deep would be adequate for present and anticipated needs.

4. Recommended Improvement. To reduce groundings, damages and delays, provide for future growth of recreational boating, and meet the desires of local interests, the recommended improvement provides for a channel 100 feet wide and 6 feet deep to the head of Pawtuxet Cove with a turning basin near the end of the channel, and 14 acres of anchorage 6 feet deep with a sheltering dike. The estimated first costs, annual costs and annual benefits based on August 1960 price levels, a 50 year project life, and interest rates of 2 5/8 percent on Federal funds and 3½ percent on non-Federal funds are as follows:

a. Estimated First Cost of Construction:

Federal	$210,000	(1)
Non-Federal	210,000	(2)
Total Estimated First Cost of Construction	$420,000	

(1) Excludes preauthorization study costs of $9,000 and additional navigation aids of $11,000.

(2) Cash contribution of 50 percent. Excludes $1,000 for removal or relocation of local navigation aids, $20,000 for public landings, and $30,000 for spoil disposal dikes.

b. Estimated Annual Charges:

	Federal	Non-Federal	Total
Interest and Amortization	$8,300	$9,000	$17,300
Maintenance - Project	7,500	0	7,500
- Navigation Aids	900	0	900
Total Estimated Annual Charges	$16,700	$9,000	$25,700

c. Estimated Annual Benefits:

	General	Local	Total
Reduction of recreational boat damages	$600	$600	$1,200
Increased recreational boating, present and prospective fleet	17,500	17,500	35,000
Land Enhancements	1,000	1,000	2,000
Total Estimated Annual Benefits	$19,100	$19,100	$38,200

d. Benefit-Cost Ratio = 1.5

5. Apportionment of Cost and Local Cooperation: In view of local benefits, local interests would be required to contribute 50 percent of the first cost of construction. The improvement should be subject to the conditions that local interests:

a. Provide all necessary lands, easements, rights-of-way and spoil disposal areas with necessary retaining bulkheads, for construction and maintenance.

b. Hold and save the United States free from damages that may result from construction and maintenance of the project.

c. Provide and maintain necessary mooring facilities including two public landings with suitable supply facilities open to all on equal terms in accordance with plans approved by the Chief of Engineers.

d. Regulate the use, growth and free development of the harbor facilities with the understanding that said facilities will be open to all on equal terms.

e. Make a cash contribution toward the first cost of construction, as a lump sum prior to construction amounting to 50 percent of the Federal project construction cost.

f. Remove or relocate locally constructed navigation aids.

6. Discussion. Local interests have approved the recommended plan and advised that the requirements of local cooperation would be met. The improvement recommended provide a logical and economically feasible means of meeting the desires of local interests and the needs of navigation in the area. Analysis on the basis of an economic life of 100 years would increase the benefit-cost ratio from 1.5 to 1.7. The project is considered justified on the basis of studies and criteria in the report. Proposed local cooperation is consistent with other similar projects.